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Solvent-Free Emulsified Asphalts **by Brad Neitzke, Assistant Materials Engineer**

To some of you, the topic of emulsified asphalts suggests about as much fun as watching grass grow. To others, who could be considered “more enlightened,” this topic ranks right up there with Disney World.

Maybe some of the lack of enthusiasm comes from not understanding the subject. I can hear some of you saying “What the heck is emulsified asphalt anyway?” And probably more important, “Why should I care?”

To better understand the implications of this new technology, it could be helpful to understand what an emulsion is. The dictionary defines an emulsion as a suspension of small globules of one liquid in a second liquid with which the first will not mix. WOW! What does that mean? Maybe it’s best to explain with a couple of examples.

Whether you are aware of it or not, you probably use emulsions everyday. Some common examples of emulsions are milk, mayonnaise, salad dressing, and hand lotion. In all of these products, an oil (milk fats, vegetable oil, lanolin) is manufactured into small droplets and suspended in water. We all know that oil and water don’t mix, but in an emulsion if the oil particle is small enough it would be suspended in water and not separate. Therefore, the product will be uniform from the first part used to the last drop out of the bottle.



Federal Highway Administration



This is what happens when an asphalt is emulsified. The asphalt, a product made from the refining of crude oil, is literally cut up into very small pieces and suspended in water. The resulting product is very useful in various aspects of highway construction. One major difference for the asphalt emulsion is that the emulsification is temporary. Once the emulsion is exposed to air, it “breaks.” This means that the water evaporates but the asphalt remains in place.

Being able to emulsify asphalt has a lot of advantages for the highway construction industry. Among the advantages of emulsified asphalts are:

1. They are handled at a lower temperature than asphalt cement providing safer working conditions. This is due to the fact that the emulsified asphalt is a fluid at 140 °F, whereas asphalt cements have to be heated to 275 °F to be fluid enough for mixing.
2. They can be used to produce cold mixes. These mixes allow the aggregates to be damp and cool. This would eliminate the use of a heating system for the aggregates and provide some cost savings.
3. They are used in maintenance operations for asphalt seal coats. The handling and “breaking” characteristics are enhanced and provide a product with greater flexibility than hot applied asphalt.

These are just some of the advantages of emulsified asphalts. They are not applicable to all paving situation but are a very useful product with various applications.

There are also some disadvantages in the use of emulsified asphalts. There is one additional component that is added to the emulsified asphalt to aid in performance. This additive is a solvent (most commonly a form of gasoline) that enhances certain characteristics of the emulsified asphalt. These characteristics could be coating ability, spraying quality, or breaking time, just to name a few. From an environmental and economic standpoint, however, the solvent also provides some bad side effects. The side effects include safety hazards during manufacture and construction, lower air quality due to evaporation of the solvent, and higher cost for the product due to the cost of the solvent.

Thus the challenge: Can we manufacture a solvent-free emulsified asphalt that will provide all of the construction benefits and eliminate all of the side effects?

The question has not yet been fully answered. However, solvent-free technology is currently being developed and evaluated. The Oregon Department of Transportation’s (ODOT’s) Research Unit has developed a research project to evaluate the performance of solvent-free emulsions. To assist with the evaluation and review of the project, ODOT has formed a technical advisory committee of other industry representatives (asphalt suppliers, Federal Highway Administration, ODOT pavement personnel). The research project was approved on December 1, 1997 and addresses key factors to investigate the performance of these newly developed emulsions.

Emulsified asphalts have been widely used in highway construction and maintenance since the 1920s, initially as dust palliatives and spray applications. More recently, they have been used in more diverse paving applications such as base and surface course mixes, surface treatments and maintenance activities. For engineering, environmental and economic reasons, the use of emulsified asphalts is likely to increase dramatically in the next ten years.

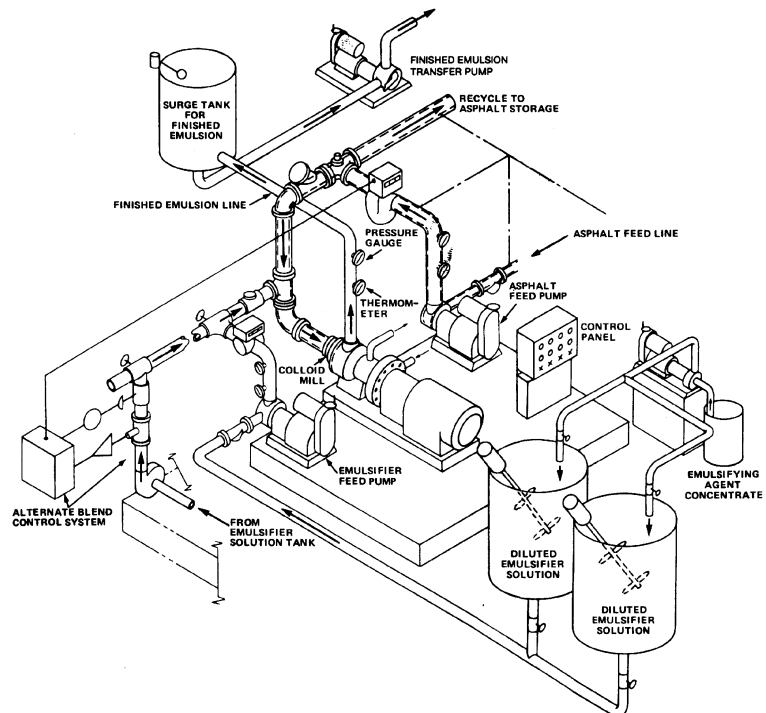
The results of this study could reduce the amount of volatile solvents used in the emulsified asphalt concrete, yielding economic and environmental benefits. Additionally, elimination of volatile solvents minimizes the fire hazard, enhancing working safety during manufacture of the emulsion and construction of the pavement section. Given the heightened environmental awareness of our present culture, the use of solvent-free technology could enhance the highway industry's image as an environmentally responsive and responsible industry.

This study will include laboratory testing, construction of test sections, and performance monitoring. The purpose of the laboratory testing is to establish the optimal mixing and handling protocol and determine mechanical properties. If results from the laboratory testing are promising, it is envisioned that test sections would be constructed to assess field performance of these newly developed products.

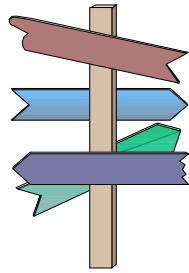
Currently, the field projects are scheduled to be constructed in 1999. It is through these field trials that a comparison can be made to analyze the performance of conventional solvent-based emulsions to that of solvent-free emulsions.

The project, although in its infancy, appears to be promising in evaluating this new technology. With this evaluation and continued work on this emerging technology, the products that we use can be cost-effective, provide equal or better performance than the current solvent-based emulsified asphalts, and minimize environmental and safety concerns.

Diagram of an
asphalt emulsion
manufacturing plant



ROAD SIGNS



“Do not be too timid and squeamish about your actions. All life is an experiment. The more experiments you make the better. What if they are a little course, and you may get your coat soiled or torn? What if you do fail, and get fairly rolled in the dirt once or twice. Up again, you shall never be so afraid of a tumble.”

- Ralph Waldo Emerson

We wish to thank all the individuals who have contributed articles for previous newsletters. If you are aware of a new technology, (or a fresh spin on an old one) please jot down your ideas and submit them via e-mail to me at the address below. Or, if you have an aversion to writing, just donate 15 minutes of your time for an interview (either by phone or in person), and I'll format the information for you. You can then review the article for accuracy (via e-mail or hard copy) and upon publication, you'll become famous in a matter of days. Remember, although we cater to road-related technology, ANY new technology information is welcome.

Please send all submissions to Kristi Swisher - (360.696.7572). Be sure your name, title, and phone number are the way you want them to appear in the article. Articles are subject to editor/ layout approval and may be condensed if space is limited.

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